

APRILIA

INSTRUCTION BOOK.



LANCIA (ENGLAND) LTD.

ALPERTON,
Nr. WEMBLEY,
MIDDLESEX.

Registro Aprilia

**For Diagrams, Illustrations, Dimensions
and Data, Please refer to Italian Text.**

APRILIA

INSTRUCTION BOOK.



LANCIA (ENGLAND) LTD.

ALPERTON,
Nr. WEMBLEY,
MIDDLESEX.

INDEX.

Foreword	4
Description	5
Control devices	8
General instructions	9
Lubrication	13
General description of components	17
Engine	17
Carburetter	21
Clutch	22
Gear Box	23
Transmission Shaft	23
Propelling Unit	24
Rear Suspension	25
Brakes	26
Front Suspension	28
Electric Equipment	28
Body Work	35

FOREWORD

The aim of this booklet is only to advise the best rules for the use and maintenance of the Aprilia Model.

We call the reader's attention especially to the Chapters referring to the engine lubrication, adjustment of brakes and maintenance of battery.

We specially recommend the rules applying to the maximum speeds during the first thousand miles (see Page 12).

We also recommend that any repairs or adjustments should be carried out by our Service Stations in Italy and/or abroad, and original Lancia spare parts should solely be used.

Our Official Service Station and Spare Parts Depot for the United Kingdom is Lancia (England) Limited, Alperton, Wembley; Telegrams, Lanciacco Wembley; Telephone, Perivale 5656.

DESCRIPTION

Engine

4-cylinder narrow V aluminium monobloc with special hard cast iron bores.

Cast iron cylinder head with overhead valves.

Hemispherical combustion chamber, with central sparking plug.

Bore 72 mm.; Stroke 83 mm.

Cubic Capacity 1352 cm³.

Max. R.P.M. 4000.

B.H.P. at 4000 R.P.M.—47.

Treasury Rating in United Kingdom 12.9 H.P.

Tax £9 15s. 0d.

Distribution

Inclined overhead valves controlled by a single shaft driven at front by silent chain, with automatic tensioning device.

Lubrication

Forced feed by gear pump.

Complete and continuous oil filtration by means of a vane filter with automatic cleaning.

Cooling

Water circulation by centrifugal pump, fan and radiator of the tube and vane type.

Water temperature controlled by thermostatically operated radiator shutters.

Fuel Feed

By mechanical pump.

Ignition

Battery and six-volt distributor.

Carburettor

Zenith (32/VIM) with starting device and silencer.

Starting

By electric motor.

Clutch

Dry, single plate.

Gearbox

In monobloc with engine, four speeds forward and reverse.

Direct top and silent third and second.

Transmission

Tubular propeller shaft with three flexible disc joints.

Propelling Unit

Final drive by Gleason/Hypoid gears, enclosed in pressed aluminium casing, fixed to the frame.

Ratio:

10 x 41 for Standard Saloon type.

9 x 41 for Chassis type.

Two shafts with cardan joints controlling rear wheels.

Brakes

Shoe expansion type.

Front brakes on road wheels.

Rear brakes on propelling unit shafts.

Foot control of the Lockheed type, hydraulically operated on all four wheels.

Hand control on rear wheels completely independent.

Steering

Worm and sector type.

All parts fitted with silent-block bushes.

Front Suspension

Lancia patent independent springing by cylindrical coil springs and hydraulic damping.

Rear Suspension

Also by patent independent wheels, as follows:—

A transversal spring resting on two actuating brackets supports the static weight of the car. Two torsion bars applied to the actuating brackets absorb any difference of load owing not only to road unevenness but also to the great lateral strain when cornering, especially at high speed.

Wheels

Disc Michelin 140 x 40.

Tyres

Michelin 14 x 40 "Stop," or 140 x 40 "Real Low Pressure"

Pressure:

Standard Saloon: "Stop" 26 lbs. "Low Pressure" 22 lbs.

Other Types " 29 " " " 26 lbs.

Electrical Equipment

M.A.B.O. 6 volt.

Dimensions of the Car

	Saloon	Chassis
Overall length	13ft. 0ins. (including bumpers)	12ft. 7½ins.
Overall width	4ft. 10ins. (outside bumpers)	4ft. 7½ins. (at wheels)
Maximum height with load	4ft. 9¼ins.	
Wheelbase	9ft. 0¼ins.	9ft. 4ins.
Wheel track	4ft. 1¾ins.	4ft. 1¾ins.
Turning circle	16ft. 4¾ins.	17ft. 0¾ins.
Height of floor from ground, with load	9ins.	11ins.
Ground clearance with load	7½ins.	7½ins.
Weight including petrol, water and spare wheel	16½cwt.	11½cwt.

Capacity of Tanks

Petrol	11 gallons
Water, including engine and radiator	1½ gallons
Oil:—Engine	1 gallon
Gearbox	1¾ pints
Propelling unit	2 pints
Steering box	½ pint
Front suspension	1 pint
Lockheed liquid	
Hydraulic brakes tank	¾ pints

Performance

Maximum speed of Standard Saloon in top gear—78/80 m.p.h.

Maximum gradient with car fully loaded and five passengers weighing 23½ cwt.:—

1st Gear	26%
2nd Gear	16%
3rd Gear	10%
Top Gear	5%

Control Devices. (Fig. 1)

- (1) Petrol gauge control.
- (2) Windscreen wiper switch.
- (3) Direction indicator control.
- (4) Electrical equipment distribution board.
- (5) Interior light switch.
- (6) Dash board light switch.
- (7) Starter hand control.
- (8) Clock.
- (9) Speedometer.
- (10) Dynamo tell-tale red lamp.
- (11) Amber lamp checking direction indicators.
- (12) Petrol gauge.
- (13) Engine lubrication oil pressure gauge.
- (14) Carburettor starting device control.

- (15) Hand throttle control.
 - (16) Accelerator pedal.
 - (17) Brake pedal.
 - (18) Clutch pedal.
 - (19) Gear lever.
 - (20) Rear brake hand lever.
 - (21) Horn button.
-

GENERAL INSTRUCTIONS

STARTING ENGINE

To start the engine place the key in the keyhole on the switch board (4) and press home in zero position. This will light the red tell-tale lamp (3), thus indicating that battery is supplying current. Then pull out the starter control (7) releasing it as soon as the engine starts.

In the event of non-starting, repeat after a short interval, to allow the starter to come to rest: this is required in order to avoid damaging the teeth of the starter pinion and/of fly wheel crown.

In winter, to facilitate starting, pull out the carburettor starting device (14), while pulling starter control (7), and leave it pulled out only for a few seconds.

When starting the engine refrain from pressing on accelerator pedal (16) or from using hand throttle control (15).

If the engine fails to start after several attempts, do not persist, to avoid discharging the battery, but check over ignition, distributor, coil, sparking plugs, electrical circuits, and fuel feed.

The carburettor starting control (14) has the effect of opening a special starting device on carburettor, that is a small carburettor supplying a richer mixture; therefore, by persisting

too much in pulling handle (14) it might happen that too large a quantity of rich mixture is collected in the inlet valve which cannot be completely burned. In this event it is necessary to return handle (14) to rest and whilst acting on control (7) to press fully home the accelerator pedal (16). This will increase the suction from the engine thus clearing petrol excess from inlet pipe.

IGNITION ADVANCE

No ignition advance is provided for, the advance being automatic.

PETROL GAUGE

The quantity of petrol in the tank is measured by means of an "ISOS" electric device of the newest type, having a tell-tale indicator (12) on the instrument board.

After having pressed the key in the keyhole press button (1), the indicator then will show in red a figure giving the quantity of gallons in the tank; if two figures are lighted in red then the quantity of petrol should be the average between the two figures.

When only half a gallon is left in the tank the white sector of the indicator will show a red light; this indication is automatic, i.e., no pressure on button (1) is required, therefore, the driver is given a warning when he is running short of petrol.

Such warning keeps on until the petrol tank is refilled over half a gallon.

FUEL FEED

Fuel feed is operated by the AC mechanical pulsation pump (P) (Fig. 2) situated in front of the radiator and behind the shutters and fastened by two bolts (B) to the aluminium bracket (S) attached to right side of the engine.

The pump is operated by the eccentric (A) taken from the shaft controlling the distributor, therefore, one stroke of the pump takes place for two revolutions of the engine.

The transmission of movement from (A) to the control lever of the pump (L) is shown in figure 2 and can be described as follows:—

Lever (L) oscillating on pin (E) operates during its lift on shackle (F), which is connected to rod (T). This lowers diaphragm (M) and compresses spring (C), thus causing a depression in chamber (N). Therefore, the petrol is sucked into the chamber by means of inlet valve (V) through gauze filter (R).

When lever (L) returns spring (C) pushes the diaphragm up, thus compressing petrol in chamber (O); petrol is then conveyed towards the outlet and sent to the carburettor through the outlet valve (V2).

When the carburettor float chamber is full and the floater needle closes the inlet hole, no petrol is allowed to pour from the pump.

In this event the pressure which has taken place in chamber (O) keeps the diaphragm at its lowest point, and, therefore, compresses the spring; consequently during such period no petrol is sent by the pump.

When the needle opens the inlet hole, the spring pushes the diaphragm upwards, automatically starting the fuel feed control again.

The pump does not require any maintenance and its operation is wholly reliable: in case some lack of fuel feed is noticed, this generally comes either from obstruction of the filter or from air bubbles in the pipes.

In the first case, dismantle pump cover (Q), and wash filter with petrol.

In the second case, check all inlet and outlet pump unions and also unions of pipes to tank and carburettor.

Only after all the above items have been checked over, and the fuel feed is still lacking, then a fault of the pump can be questioned. In such an unusual event apply to our Works or Service Stations.

N.B.—In case the tank has been completely emptied it may occur that some difficulty arises when starting. This is owing to the fact that the pump wants to be primed; which can be

done by operating the electric starter during, say, 30 seconds, the car being on a level floor, or better on a slight slope forward.

WHEN THE CAR IS NEW

In order to allow all the parts of the car, and especially of the engine to gradually settle it is recommended for the first 650 miles that the following speeds be not exceeded:—

- 20 m.p.h. in 1st Gear.
- 30 m.p.h. in 2nd Gear.
- 40 m.p.h. in 3rd Gear.
- 65 m.p.h. in Top Gear.

After the first 650 miles the oil sump should be emptied and refilled with fresh oil.

The car then can be utilised at its maximum efficiency, but owing to the fact that the engine is remarkably well balanced, the driver is then tempted unconsciously to exceed the maximum R.P.M., beyond which damage may be caused to the engine.

Therefore, it is essential that the following speeds never be exceeded:—

- 40 Kms., i.e., 25 m.p.h. in 1st Gear.
- 60 Kms., i.e., 37 m.p.h. in 2nd Gear.
- 90 Kms., i.e., 56 m.p.h. in 3rd Gear.

We strongly urge the above recommendations, and ask drivers to refer frequently to the indications of the speedometer.

BEFORE STARTING THE ENGINE

Check level and refill oil tank up to the mark "MAX."

Check water level in radiator and refill if necessary, avoiding hard water if possible.

WHILST RUNNING ENGINE AND WHEN DRIVING

Do not fail to frequently watch the position of oil gauge hand. Oil pressure is sufficient when the hand, between medium and high speeds, keeps on the dial sector marked "NORMAL."

When the engine is running at full speed and the hand does not reach the "NORMAL" mark then the oil pressure is not sufficient and it is necessary to check the oil pressure regulating valve and clean it if necessary.

LUBRICATION

The following oil brands are to be used:—

ENGINE

Gargoyle Mobiloil A, or Veedol Medium 3.

In winter or cold climates whenever starting is difficult we recommend Gargoyle Mobiloil Arctic, or Veedol Winter Medium 2.

GEARBOX—PROPELLING UNIT—STEERING BOX

Gargoyle Mobiloil ultra heavy or Veedol ultra heavy.

FRONT SUSPENSION—CENTRAL BEARING OF TRANSMISSION SHAFT

Gargoyle Mobiloil A or Veedol Medium 3.

LUBRICATION INSTRUCTIONS

ENGINE

The main filler, provided with a cap, is found on top of the cover of the cylinder head, left side.

The level is shown by a dip stick on which "MAX" and "MIN" indicate the average oil level required for good lubrication.

To the dip stick indications any good driver should always refer before starting the engine.

After the first 650 miles, and after each 2,500 miles, the sump should be emptied and refilled with fresh oil (1 Gal.).

GEARBOX

The filler is found on the left side of the gearbox, and can be reached after having removed the front seats carpet, through an appropriate hole on the left side of the transmission shaft tunnel.

The level is correct when the oil reaches the edge of the filler.

After 2,500 miles check level and refill if necessary.

After 5,000 miles empty the gearbox and refill with fresh oil (1 $\frac{3}{4}$ pints).

PROPELLING UNIT

The filler is found on top of the casing and the level is checked by means of a stick attached to the tap; the correct level is shown by "L" mark on the stick.

To refill, unscrew the plate underneath the spare wheel, and the filler tap will be easily reached.

After 2,500 miles check level and refill if necessary.

After 5,000 miles empty the casing and refill with fresh oil (2 pints).

STEERING BOX

The filler is found in the centre of the box.

The level is correct when the oil reaches the edge of filler.

To refill remove the radiator cowl.

Each 2,500 miles check level and refill (if necessary).

FRONT SUSPENSION

Each 2,500 miles refill with oil by means of a syringe, which is supplied with the kit, following the detailed instructions on Page 25.

REAR TRANSVERSAL SPRING

Each 7/9,000 miles refill with grease the box at both ends of spring to which the cables are attached.

To do this unscrew the nuts of the pins of the boxes, fill them with grease and screw them on again as if they were ordinary greasers; repeat the operation until grease pours out through the holes of the box.

Thick grease, as used for ballraces, is recommended.

A periodical lubrication of the leaves can be done by any service station by the pressure system.

CARDAN JOINTS AND REAR SHAFTS

These are mounted with cylindrical rollers, enclosed in air-proof casings filled with grease, and, therefore, do not require any lubrication.

Only in case of general overhaul of the car the joints should be disconnected and the cases refilled with grease.

Thick grease is recommended.

FRONT AND REAR WHEEL HUBS

Each 15,000 miles check if ballraces are sufficiently greased, and if necessary smear them with grease.

CENTRAL BEARING OF TRANSMISSION SHAFT

Each 5,000 miles this part wants lubricating by screwing up the special syringe.

This is done through the hole which is found on the transmission shaft tunnel, underneath the rear seat carpet.

ELECTRIC INSTALLATION

No lubrication is required for the dynamo and starter.

The distributor is lubricated by means of a greaser fitted on the distributor itself.

Each 1,500 miles give two turns to the greaser; if, however, same is already screwed home this indicates that it wants refilling with a fresh supply of grease.

Use only special Bosch distributor oil.

OIL CIRCULATION

This is of the type of pressure oil circulation (See Fig. 3). Refilling of oil is done through filler (1).

Level is checked by stick (8) giving "MAX" and "MIN" level, between which stands the average level admitted for a good lubrication.

The oil, sucked by the gear pump (3), through pipe (12), is filtered by a net filter (4) and sent under pressure to the vane filter (5) and forced through the vanes. Pouring out from the central part of the filter the oil is forwarded to the main lubrication pipe of the engine. From this pipe oil is distributed to pipes (14) (15) (16), and lubricates the three crankshaft bearings.

The oil, then, through the extension of pipe (14), is forced through the holes of the crankshaft, flows to the connecting rod bearings; the central bearing feeds the lubrication of two connecting rods, whilst the end bearings feed a single connecting rod each.

The oil, then through the extension of pipe (14), is forced up to lubricate gear (17) of the camshaft chain adjustment, and is then carried up to the front bearing (18) of the camshaft (19).

From bearing (18) oil passes on inside the camshaft itself (19) and through several appropriate holes (20) and (21) lubricates the central and rear bearings.

From hole (20) of central bearing the oil branches out and penetrates into the rocker arm pipe (22), from which through appropriate holes it pours out to lubricate the central upper rocker arms; from the same hole (20) branch out pipes (9) and (11), which bring lubrication to the side lower rocker arms.

After having lubricated the rocker arms the oil returns to the sump by trickling along the front face of the engine and at the rear being conveyed by pipe (25).

The controlling shafts of distributor and petrol pump are lubricated by the oil trickling in front of the engine, the oil being collected in a small cup (28).

The oil pressure is controlled by a regulation valve (26) connected with the extension of pipe (14). This valve is set

on the right side of the engine behind the distributor, and its seat is closed by a screwed tap. The valve opens only when oil reaches a pressure of 43 lbs. per sq. in., corresponding to "NORMAL." mark on the dial of the oil pressure gauge on instrument board.

To dismantle the pressure regulating valve (26) unscrew the plug, draw out the regulating spring and then the valve itself.

On the left lower side towards the front is fitted the protective valve (7) and the vane filter. When this filter becomes dirty, therefore increasing the pressure up to 85/100 lbs. per square inch, the protective valve opens automatically.

CLEANING OF VANE FILTER

This is automatic and takes place every time the clutch pedal is pressed. This rotates the filter by means of a rod and the vanes are automatically cleaned (Fig. 11).

By this cleaning impurities and carbon deposits fall to the bottom of the filter barrel, and can be removed through the lower plug every 3/4,000 miles.

GENERAL DESCRIPTION OF COMPONENTS

ENGINE COOLING SYSTEM

This is composed of a centrifugal water pump, a radiator and a fan.

The body of the pump (P) (Fig. 4) is mounted by means of nuts and four pins coming out of the lower tank of the radiator left side. Therefore, it is very easy to dismantle after having taken off the radiator cowl in case of overhauls or in order to replace the packing.

The pump is operated by the V-shape belt set at a triangle, driven by crankshaft and controls at the same time the fan and the dynamo.

The radiator is of the film type and is mounted with rubber blocks on the front brackets of the engine, therefore, the radiator is solid with the engine-gearbox bloc.

Water temperature is automatically regulated by means of shutters operated by a thermostat fitted on top of the upper tank of the radiator. The control from thermostat to shutters is obtained by means of a flexible cable, therefore, when taking away the radiator cowl it is necessary to unhook the end of the cable from the rod controlling the shutters.

So long as water does not reach 70° Cent. i.e. 158° F. the shutters remain closed; as soon as this temperature is reached the shutters start opening gradually; they are fully open at 75° Cent. i.e. 167° F.

To avoid dust preventing the shutters from opening freely it is advisable when washing the car to clean the shutter slots and ascertain that they rotate freely.

It is useful to remember that when shutters do not open freely the engine temperature rises with very serious consequences for all the parts, and especially the cylinders and cylinder head.

It is also advised that the water should be completely replaced once a month to avoid deposits which are very damaging for the regular working of the engine. When replacing water the engine should be running at low speed. Pour water in the upper tank of the radiator and leaving open the outlet tap until the water coming out through the outlet is clear; at this moment the tap should be closed and the radiator filled up. The tap is easily operated by means of an appropriate handle on the left side.

The belt tension should be periodically checked. The tension is correct when the fan can still be operated by hand without too great an effort.

To increase tension release screw (V) (Fig. 4) tightening the elastic fastener blocking dynamo to radiator, then rotate by hand in an anti-clockwise direction until the tension appears sufficient; then screw up screw (V).

To carry on all these operations it is necessary to take off the radiator cowl.

IGNITION AND TIMING

The distributor and coil do not require any maintenance and must never be dismantled (see special instructions on Pages 32 and 33).

If engine starting is difficult or if the engine is mis-firing examine the sparking plugs and/or the make and break of the distributor.

M.A.B.O. W. 175 T3 plugs are recommended.

The clearance between the centre stem of plug and electrodes must be 0.6 mm., and that of the make and break of the distributor 0.3/0.4 mm.

To remove a plug from the engine the procedure is as follows:—

(a) Remove from engine cover tap (t) to which the ignition cable is attached. To do this turn the tap to the left.

(b) Unscrew with the appropriate tool the case carrying the plug, the hexagonal nut of which appears through a hole in the cover, from which the tap (t) has been removed.

(c) Remove the case, lifting it vertically; the sparking plug will be found attached to the bottom of the case by means of an elastic device.

(d) Detach plug from case by pulling it out against the resistance of the elastic device.

To re-assemble, proceed inversely; never forgetting when re-assembling to make sure not to miss the copper washer.

The distributor has a fixed advance of 13° relating to TDC and the automatic advance range is 30° relating to crankshaft, starting at 5/600 revolutions.

The timing of the distributor can be checked as follows:—

(a) By means of starting handle rotate the crankshaft until the A/A marking (ignition advance) on the flywheel is visible through the hole (F) in the flywheel casing and meets tooth (O) of the flywheel crown.

(b) In this position of the crankshaft, if the timing is right the distributor rotor tip should start breaking and the

distributor brush should be found corresponding to the end of the lead connecting with sparking plug No. 1.

If this does not happen do not remove the distributor but release screw fastening the distributor plate to the engine, and adjust the distributor slightly, as required. Then tighten screws and re-check timing, as above.

The order of ignition is given by table 18.

The number of each cylinder is shown in red on the engine cover.

VALVE SETTING AND TIMING

The checking of clearance must be done when the engine is hot. The clearance between valve and rocker arm is 0.25 mm. for both inlet and outlet valves.

We advise to check periodically this clearance with the filler gauge supplied with the tool kit, especially when the car is generally used at its highest performance (motor roads, i.e., auto strade); frequent checking of the valve clearance ensures the better condition and durability of the valve seats and of the valves themselves.

In view of the special disposition of the valve control (Figs. 9 and 10) please note that registration screws (R1) of the four inlet valves are to be found on the right side of the engine (carburettor side) and those of screws (R2) of outlet valves on the left side of the engine (exhaust side).

DISTRIBUTION SETTING

For camshaft timing proceed as follows:—

(1) Adjust inlet and exhaust valve on No. 1 cylinder using the appropriate feeler gauge and leaving a clearance between valve and rocker arm of 0.45 mm.

(2) Turn engine by hand until the tooth of the crown bearing mark (O), corresponds with mark (1/3) on each of the inspection holes on top of flywheel casing. In such position No. 1 cylinder piston is at TDC.

(3) Turn camshaft until No. 1 cylinder exhaust valve closes and inlet valve starts opening.

(4) Then set the position of camshaft gear by inserting controlling dowel in the hole of gear, which corresponds exactly to one of the holes in the camshaft flange (G) (Figs. 9 and 10).

(5) Having so determined the exact position of camshaft gear fasten same to the camshaft by means of the appropriate screw, but before finally tightening the screw make certain that the protruding part of the dowel sets in the appropriate seat of the washer between screw and gear.

(6) Then adjust the inlet and exhaust valves of the four cylinders with a clearance of 0.25 mm. by means of the feeler gauge.

ENGINE COMPRESSION

We advise that compression should be checked in the cylinders from time to time, therefore, remove all sparking plugs and check each of them separately on each cylinder by turning the engine by hand.

In case in some cylinder the compression appears to be insufficient check clearance with feeler gauge, then, if necessary, dismantle the cylinder head and grind in valves and seats.

We suggest that this should be carried out at our Works or official Service Stations.

CARBURETTOR

The carburettor is the Zenith type 32 VIM, with starting device.

It is adjusted by the manufacturer to give the best results and its setting must never be altered.

The adjustment is as follows:—

Diffuser	24 mm.
Main jet	110
Compensating jet	60
Slow running jet	60
Starter bush	4
Starting jet	130

The irregular running of the engine if emanating from the carburettor is indicated:

(a) By repeated spitting at high speeds and when the car is fully loaded.

(b) By irregularity of firing with smoke from exhaust.

In the case of (a) the trouble is due to the failure of petrol feed, i.e. pump troubles (Page 10) or dirty filters, or choked carburettor jets, or water in the petrol.

The latter is easily ascertained by removing cover (Q) of pump (Fig. 2). If water is found in petrol it is imperative to detach the pump from its support and empty the petrol tank completely in order to have it thoroughly cleaned.

If there is no water in the petrol, clean the pump filter, the filter connecting pipes to carburettor, dismantle main jet and compensating jet and blow through them, or use very fine horse hair in order not to alter the hole gauge.

In the case of (b) the trouble comes from too rich mixture. If this is owing to defective floater and floater needle, giving too high petrol level, replacement is needed, which can be supplied at our Service Stations.

If the cause is jets getting loose in their seats or faulty washers allowing leakages, then replace with new washers and tighten up jets.

CLUTCH

The clutch is of the dry single plate type and does not require any special maintenance.

The free movement of pedal (P) (Fig. 11), i.e. before it operates on the clutch must be $\frac{5}{8}$ " to $\frac{7}{8}$ ".

When wear has taken place on the clutch linings, the free movement is reduced below the above figures. It is, therefore, necessary to re-adjust by detaching fork (F) from lever (L) protruding from gearbox, and unscrew rod (T1) as much as is required in order to re-set the free movement at its normal figure of $\frac{5}{8}$ " to $\frac{7}{8}$ ".

We remind the driver that each time the clutch pedal is pressed down, during rotation of collar (C) clutch control rod

(T2) is pulled. This being connected to handle controlling the oil vane filter (Fig. 11) the automatic cleaning of the filter is ensured.

GEARBOX

The Gearbox has four forward speeds, with silent second and third.

No special maintenance is required, except the normal lubrication (Page 14).

The gear lever is of the ball type, its neutral position being a central one.

The lever positions are as follows:

1st speed . . .	Forward left.
2nd speed . . .	Back left.
3rd speed . . .	Forward right.
Top gear . . .	Back right.

For reverse move the lever to the right as far as possible overcoming the resistance of the interior springs and bringing backward the lever.

TRANSMISSION SHAFT

The transmission shaft is tubular and is divided into two sections connected by means of an elastic disc joint. Close by such joint the shaft is separated by a bearing elastically fastened to the built-in body; this bearing has a roller race.

The connections of the two ends of transmission shaft respectively to the gearbox shaft and to the end of the pinion of the propelling unit consist of elastic disc joints.

No special attention is required for the transmission shaft, excepting a periodical lubrication of the central bearing (Page 15).

If dismantling is necessary to fit new discs to the joints we advise clients to apply to our official Service Stations.

If the owner desires to carry out this repair personally, care should be taken when reassembling that ends (E) of each fork (F) must rest on ends (E2) seats of centraliser (C) (Fig. 12). The latter is a plate in the shape of a three-point star applied to both faces of the elastic disc.

PROPELLING UNIT

This is in the place of the usual so-called back axle, which is normally found in cars where suspension is by means of two rear springs and two rigid shafts.

Casing (S) of propelling unit (Figs. 13, 14, 15) is mounted on the two cross-members T1 and T2, which are connected to the built-in body by means of silent blocks fitted at the ends of said cross-members.

The casing contains the conical hypoid group and the differential unit.

The transmission shaft transmits the movement from the gearbox to the pinion of the hypoid gears by means of the flexible disc joint connected to fork (F); through the conical hypoid group by means of the differential system the movement is transmitted to hubs (M1) and (M2) to which the road wheels are attached; such transmission is operated by means of two lateral shafts (A1) and (A2), each of which is articulated by means of two cardan joints (G1) and (G2).

Each lateral shaft is also provided with a sliding joint (G3).

Owing to the special assembly of the two cardan joints and the sliding joint, each lateral shaft can articulate, incline, lengthen and shorten, according to the position that each road wheel, independent from the other, takes during the motion of the car; thus reproducing the unevenness of the road.

On each side of the casing a disc (D) bears the brake shoes and drum (E), the latter being fitted to the first section of the lateral shaft before joint (G1), thus remaining solid with the shaft during the rotation.

Therefore, by pressing the brake pedal (Page 23), the hydraulic brake control, which is also fitted on disc (D) actuates the brake shoes; this presses on the interior surfaces of drum (E) thus obtaining the braking of the lateral shaft and consequently of the road wheel, which is attached to the end flange of the shaft.

The propelling unit does not require any special maintenance except periodical lubrication of casing, containing the conical hypoid group (Page 14) Of course, when brake liners are worn it is necessary to re-adjust the brakes (Page 26)

REAR SUSPENSION

This is of the patented independent wheel type. Its components are a transversal semi-elliptic spring and two transversal torsion bars.

Spring (M) is attached by its centre to the propelling unit casing by means of cable (T) to the central part of mobile arms (B) supporting hubs (M1) and (M2) of rear wheels.

The cable is bound in U-shape; the ends of the "U" are rigidly tightened by box (O) which is articulated at the ends of the transversal springs, and the central part of the "U" is tightened in a box which is articulated on the mobile arm (B). Both boxes are articulated on cylindrical rollers at the end of each arm (B) opposite to the end which carries the hub.

Torsion bar (T) is interlocked in a special tube (N) solid with arm (B).

Each torsion bar has two cylindrical ends provided with longitudinal splines and teeth; one of these fits in an appropriate splined sleeve in the front cover of the propelling unit, the other fits to the end of the mobile arm (B) and is tightened by means of collar (C) with a bolt and nut. Therefore, when the mobile arm oscillates owing to the vertical movement of the road wheel the torsion bar reacts with its torsional elasticity and opposes the resistance to the road wheel movement.

The torsional reaction becomes stronger as the vertical displacement of the wheel becomes larger.

The transversal spring is adjusted by the Factory in such a way as to support exactly the weight of the car keeping the horizontal position under normal load; also the fitting of the bars is adjusted in order that they remain inert under the same load; therefore, the torsion bars start operating only when there is an excess of static load, i.e. the bar reaction

integrates the load of the spring when the road wheel moves upwards and brakes the return of the spring when the road wheel moves downwards, consequently avoiding the bouncing of the car.

This elastic and articulated mounting in the central part of the spring is to ensure that when one of the wheels moves upwards following a bouncing the other wheel counteracts by pushing downwards, therefore, keeping its contact with the ground; this effect is also obtained to a good extent when the car corners, counteracting the tendency of the inside wheel to jump off the ground.

Two friction shock absorbers are fastened to the built-in body with nuts and bolts and connected by means of rods to arms (B) to the effect of braking the elasticity of the system.

The rear suspension does not require any special maintenance; we only recommend periodical greasing of the box of the transversal spring where the cable rods are attached (see Page 15), and dismantling and cleaning of shock absorbers when they become too stiff; shock absorbers should be adjusted at 28 Kg.

BRAKES

The hydraulic Lockheed system brakes operate on all four wheels and are controlled by a pump operated by the foot pedal.

The mechanical brakes operate on the rear wheels only and are controlled by the hand lever. For brake lay-out see Fig. 16.

The foot brakes are correctly set if the full braking effect can be obtained by half pedal movement.

The hand brake is correctly set when the lever can be locked on three teeth of the brake ratchet.

BRAKE ADJUSTMENT

Foot brakes.—If full braking efficiency is not obtained by half movement of the pedal then adjustment is required.

Such adjustment does not aim to regulate the effect of either brake relating to the other because with the Lockheed system all four brakes are compensated; the adjustment is only to balance the normal wear of the brake linings.

To carry out this adjustment raise each wheel and by means of a spanner turn nut "A" to the right until the friction of the shoe on the drum is noticeable, then turn nut "A" back 1/12th of a turn, i.e. half of the side of the hexagon nut. The wheel should then rotate freely without any friction of the shoe on the drum.

A similar adjustment should be made for the other shoe by turning nut "B" which must rotate to the left for tightening and to the right for releasing.

By adjusting the four nuts "A" and "B," as above, for all four wheels, brakes are correctly adjusted and the braking effect should be obtained by half movement of the pedal, as stated above.

Nuts "A" and "B" of the front wheels can be easily seen by an operator facing the inside of each wheel.

As for the rear wheels, it is necessary to take off the plate which closes the slot underneath the spare wheel by undoing the four screws which fasten the spare wheel.

IMPORTANT NOTICE

Never alter the position of nut "C" regulating the play of the pedal controlling pump.

This is adjusted by the Works and should not be altered.

If any irregularity of brakes is found we advise to apply directly to our Works.

We advise to check periodically:

- 1. That piping is in perfect condition.*
- 2. That catches fastening pipes do not become loose.*
- 3. That level of liquid in tank is not under half height of tank. If this happens refill tank, using only original Lockheed liquid No. 5. Any other liquid which is not the original one is unsuitable for the brakes, and will definitely damage the special rubber*

washers, and we decline any responsibility for the consequences.

HAND BRAKE.

To adjust the hand brake, release clips "M" fastening the brake cable to the hand brake cable and allow the brake cable to slide in clip until by operating the hand lever the brake locks on the third tooth of the ratchet.

FRONT SUSPENSION

This is of the well-known Lancia type with independent wheel springing.

All moving parts are lubricated and consequently protected from dust, water and mud. Therefore, the maintenance of the suspension is practically confined to refilling with oil. This must be done after each 2,500/3,000 miles.

To refill with oil proceed as follows:

(a) Screw on to plug "R.1" the special syringe and press until oil flows from bottom of aluminium cover "C."

(b) Unscrew plug "T," then screw syringe on to "R.2" and press until oil flows from hole of "T.1," when filled up replace "T.1."

In order to screw up syringe on "R.1" and "R.2" it is necessary to steer front wheels to the right.

We recommend that front suspension should never be dismantled.

The car should be brought to our Works if attention is required.

ELECTRICAL EQUIPMENT

Electrical equipment consists of 6v. lighting, starting, and ignition, with the following parts (see Fig. 18).

1. 6 v. 66 AH accumulators.
2. Constant tension dynamo.

3. Red tell-tale lamp in dynamo circuit.
4. Engine starter.
5. Distributor with automatic advance.
6. Distributor coil.
7. Sparking plugs.
8. Switchboard.
9. & 10. Head lamps, including side lamps.
11. Tail lamp.
12. Stop indicator.
13. Control of stop indicator.
14. Electric horn.
15. Horn button.
16. Direction indicators.
17. Control for direction indicators.
18. Tell-tale lamp of direction indicators.
19. Twin screen wiper.
20. Control for same.
21. Instrument board lights.
22. Switch for same.
23. Interior light lamps.
24. Switch for same.
25. Petrol gauge indicator.
26. Dial of same.
27. Control for same.
28. Fuse box.
29. Distribution box.
30. Junction box.

Each cable has at its end a brass clip bearing numbers corresponding to the numbers on the terminal block of switchboard or part to which it should be connected.

SWITCHBOARD

The current from the battery and dynamo is carried to the switchboard by means of cable No. 30, and is distributed to the following circuits:—

Engine ignition, side lamps, head lamps, tail lamp.

The service circuits, *i.e.* horn, instrument board light, interior light, windscreen wiper, direction indicators, stop lamp,

are always in current because each circuit has its own switch or button independent of the switchboard. All the service circuits are taken from distribution box and are protected by a single fuse which is found in this box.

The current to circuits connected by switchboard is branched by the switch key; when this key is pressed fully home it can be turned to the four indications 0, 1, 2, 3.

0. Conveys current to the circuit of engine ignition and petrol gauge.
1. In addition to the former gives current to side lamps and tail lamp.
2. Includes all the above and gives current to dimmed head lamps.
3. Gives current to No. 1 position and to head lamps.

The key can be withdrawn at any position. The circuit relating to its position will remain on but the engine will be switched off.

When stopping the engine withdraw the key, or leave it half way, to avoid heating of coil and consequent damage to circuit.

FUSE BOX

The fuse box is found under the bonnet and contains six fuses each of 15 amp. Each fuse has its appropriate clip and can be easily replaced. Each fuse protects a distinct circuit as follows:—

- Fuse 1. Circuit of offside head lamp.
- „ 2. Circuit of nearside head lamp.
- „ 3. Circuit of offside dimmed head lamp.
- „ 4. Circuit of nearside dimmed head lamp.
- „ 5. Circuit of side lamps and tail lamp.
- „ 6. Distributor coil and tell-tale lamp.

In case of fault in one of these circuits the fuse blows and can be easily replaced.

If a fuse continually blows the fault should be traced in the wiring circuit.

The distribution box is found underneath the fuse box, from which are branched all service circuits (Page 29) and they are all protected by a single 40 amp. fuse, which can easily be replaced.

If this fuse blows again, look for the fault in circuits and have it repaired.

DYNAMO

This is of the type M.A.B.O., M.R.G., 90/6/1500, with tension regulator. It does not require any special maintenance or lubrication and its normal working is indicated by a red tell-tale lamp (3) on the instrument board.

When the switch key is fully home the red lamp should show when the engine is off or turning slowly. As soon as the engine is accelerated the red lamp should go out and this indicates that the dynamo is charging the battery. Should the red light not show, when key is fully home, when the engine is off or turning slowly, then check Fuse No. 6 and replace if blown. If fuse continually blows, this indicates that a fault exists in the circuit from fuse to red lamp, or to distributor coil, or to petrol gauge.

If red lamp does not show and fuses are in order, this means that the bulb of red lamp has blown or battery does not supply current. Therefore, replace bulb or charge battery.

If red lamp remains on when the engine is accelerated this means that the dynamo is faulty, or the returning circuit from lamp to dynamo makes contact, consequently the dynamo is not operating.

To dismantle dynamo take care to detach first the positive cable (+).

ENGINE STARTER

This is of the type M.A.B.O., M.C.E., 0.4/6 R, and does not require any special maintenance.

The starter is actuated by pulling lever (7) underneath instrument board.

If the starter works normally but does not start the engine, wait and start again, as per instructions on Page 9.

If when pulling the lever the starter does not work check the connections of cables on battery to see that they are tight and clean. If these are in order it means that the battery is either discharged or faulty, or there is some fault in the circuit starter-battery-mass.

Before dismantling the starter take care to detach first the positive cable of battery (+).

IMPORTANT NOTICE

The starter circuit is independent of the switchboard. Therefore, even when the key is not fully home the starter can be operated by pulling the lever (7).

In such a case the engine will not start because the ignition is not being supplied with current.

BATTERY

The battery is found under the bonnet on the nearside and is a 6 volt 6 A.H.

This battery has a very long life provided it is periodically checked and well looked after as follows:—

1. Keep it clean by cleaning away with a cloth soaked with water and soda any acid deposit on top of battery.
2. Keep the terminals secure and clean from sulphating.
3. Never allow the acid to fall below the top of separators. Should the acid fall to a low level only add distilled or clean rain water, never acid or any other liquid.
4. Each 3/4 months, especially if the car or battery has been out of use, test the density. This should be 1.24 (28° Beaume). If this has dropped below 1.10 (18° Beaume) the battery should be recharged.

DISTRIBUTOR COIL AND DISTRIBUTOR

The distributor is of the Marelli type S.T.489 with a 6v. coil.

Neither requires special maintenance.

In the coil there are two circuits, namely primary, *i.e.* lower tension, and secondary, *i.e.* high tension.

The first is fed by the current from the battery.

This current after having gone through the interior coil winding comes out through terminal (1) of coil, then proceeds to terminal (1) of distributor. At each break of the circuit produced by the rotating cam of distributor, high tension current is induced in the secondary circuit of coil and conveyed by means of cable leading from No. 4 terminal of coil to the centre of distributing plate. Thence by means of a carbon contact the current reaches the rotor operated by the vertical shaft of distributor, from which it is branched to the four cables leading from the distributor cover to each sparking plug.

If the ignition should fail when attempting to start engine, first check fuse No. 6 in fuse box. Alternatively, check the primary circuit to ensure that it is not shorting or improperly insulated.

If after this, ignition still fails, check the insulation of the lead from coil to distributor. Also inspect the carbon brush in the distributor cover.

In the event of irregular ignition during the running of the engine, check over the connections of the low tension circuit to the various terminals, fuses, coil and distributor, and also those of the leads from the distributor to the plugs and the plugs themselves.

Inspect the high tension cables to all plugs and replace when necessary.

Clean the platinum points of distributor with a fine magneto file (never with emery cloth), or fit new plugs if necessary. If, notwithstanding all these various items, mis-firing continues the fault should be looked for in the coil or distributor, which want replacing.

ELECTRIC HORN

This is Marelli T27 and is operated by pressing button (21) in the centre of the steering wheel.

If the horn should fail to sound check the fuse and the circuit between the fuse box and horn, making sure that the cable and connections are properly tightened.

HEAD AND SIDELAMPS

As stated on Page 15 each head lamp has its own circuit and is protected by a special fuse.

If one of these circuits fails the other remains still in operation, therefore, it is impossible for both head lamps to go out at the same moment.

In case of failure check fuse and the cables of the circuit.

The head lamps are fitted to the front wings by means of bolt and nut. They can be easily adjusted as follows:— (Table 19.)

- a. Dismantle from the body of the head lamp frame (C) unscrewing screw (V₁); together with frame the glass reflector, bulb holder, and bulb come out (Fig. 1).
- b. Release nut (D) fixing the body of the head lamps to front wing (Fig. 2).
- c. Replace provisionally frame (C) on head lamp and put on the lights.
- d. Move slightly by hand the body of the head lamp, upwards or downwards, left or right, until the required adjustment is obtained (Fig. 3).
- e. Remove again frame (C) and fasten nut (D) in order to fix head lamp in the required position, then reassemble definitely frame (C) screwing up screw (V₁).

N.B.—The frame cannot be re-assembled on the body of the head lamp if the tongue protruding from the upper edge is not introduced in the slot existing on top of the head lamp.

To replace bulbs of side lamps remove the frame of head lamp, and the bulb will be found in the bulb holder outside the reflector; then reassemble frame on head lamp (Fig. 4).

To replace bulb of head lamps it is necessary to dismantle the bulb holder of reflector by releasing screw (V₂) (Fig. 5).

Should the electrical system fail we advise the car to be brought to our Works or Service Stations.

MAINTENANCE OF BODYWORK

For the good maintenance of painting it is necessary that the car be kept as far as possible clean and dry.

Cleaning should be carried out only with water and sponge, and drying by means of chamois leather.

It is irrelevant if the leather is sometimes tinted with the colour of the car.

Avoid contact of petrol, alcohol, soap, soda, and of the brake liquid with the paint, and prefer shady parking places.

Only use the usual polishes if painting has lost its brilliance.

Repaint undercarriage and the underneath of the wings when necessary.

Registro Aprilia

RICHARD HENRY & SON, LTD
LONDON.